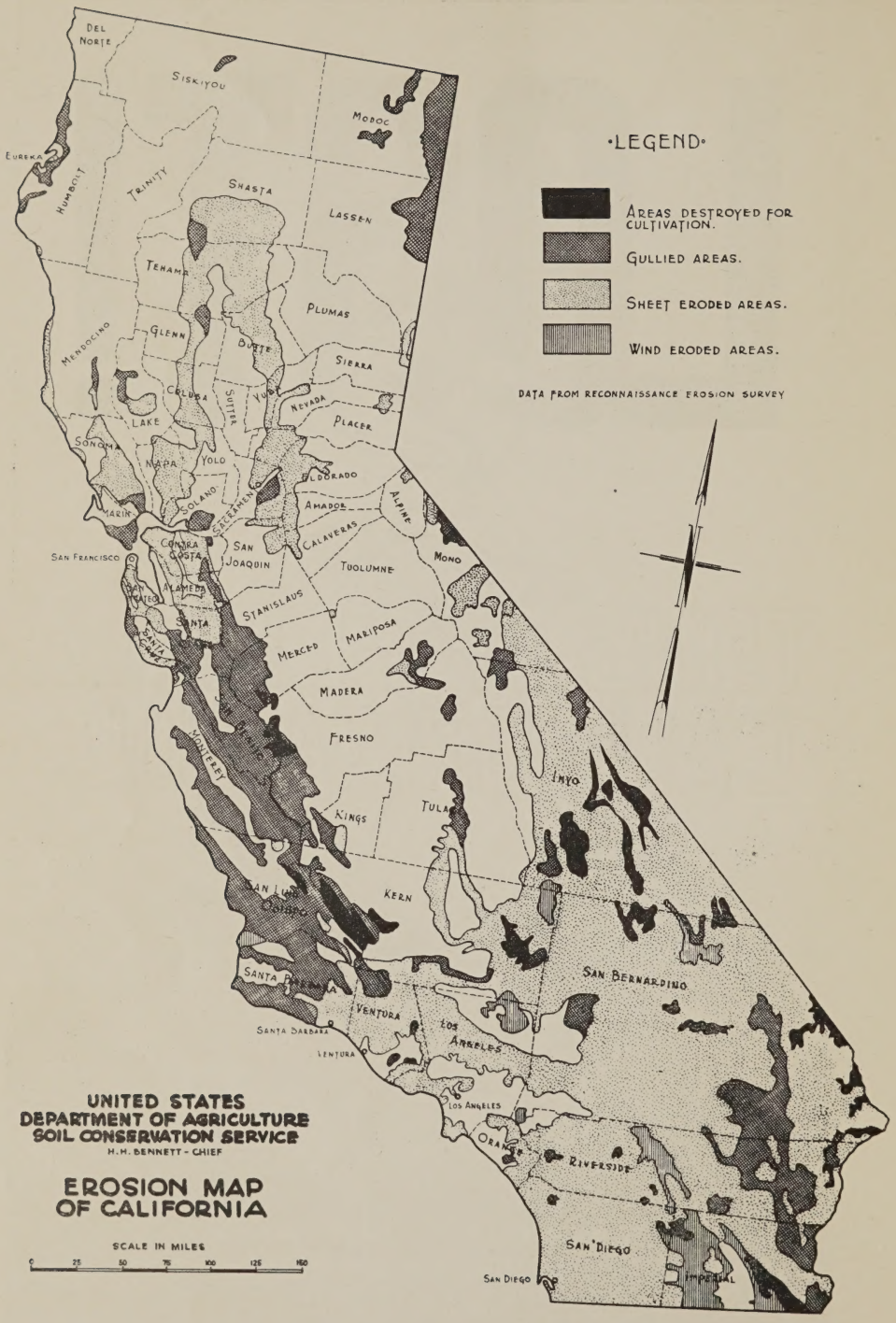
# LOST!

## TONS OF FERTILE CALIFORNIA SOIL

## BY EROSION

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H.H. BENNETT, CHIEF


·LEGEND·
AREAS DESTROYED FOR CULTIVATION.
GULLIED AREAS.
SHEET ERODED AREAS.
WIND ERODED AREAS.
DATA FROM RECONNAISSANCE EROSION SURVEY
DEL NORTE
SISKIYOU
MODOC
EUREKA
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
COLUSA
SUTTER
YUBA
NEVADA
LAKE
PLACER
SONOMA
NAPA
YOLO
EL DORADO
SOLANO
SACRAMENTO
AMADOR
ALPINE
MARIN
CONTRA COSTA
SAN JOAQUIN
CALAVERAS
SAN FRANCISCO
TUOLUMNE
MONO
ALAMEDA
SAN MATEO
STANISLAUS
SANTA CLARA
MERCED
MARIPOSA
SAN BENITO
MADERA
MONTEREY
FRESNO
INYO
KINGS
TULARE
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
LOS ANGELES
ORANGE
RIVERSIDE
SAN DIEGO
SAN DIEGO
IMPERIAL
UNITED STATES
DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
H. H. BENNETT - CHIEF
EROSION MAP
OF CALIFORNIA
SCALE IN MILES
0 25 50 75 100 125 150

## DID YOU KNOW

1

That the chances are that you live in one of the shaded portions of this map?

2

That the shaded areas produce over 40% of California's agricultural wealth?

3

That by far the greatest percentage of value in agricultural land is in the top few inches, or the topsoil?

4

That man-made erosion has robbed this state of millions of dollars through decreased yields, loss of fertility and abandoned acres?

5

That the loss of over three-fourths of the topsoil and some subsoil is a prevailing condition on more than 3,000,000 acres in California?

6

That the necessity of saving the fertile soil is of utmost concern to every man and woman today, because whether you actually farm the soil or not, you must have food—and food can come from only one source—the soil?

7

That in certain parts of the world today, six people have to wrest a scant subsistence from a single acre of land? Would any American knowingly pass such an inheritance to the America of tomorrow?

The following pages describe what is now happening in California and what is being done to control erosion.

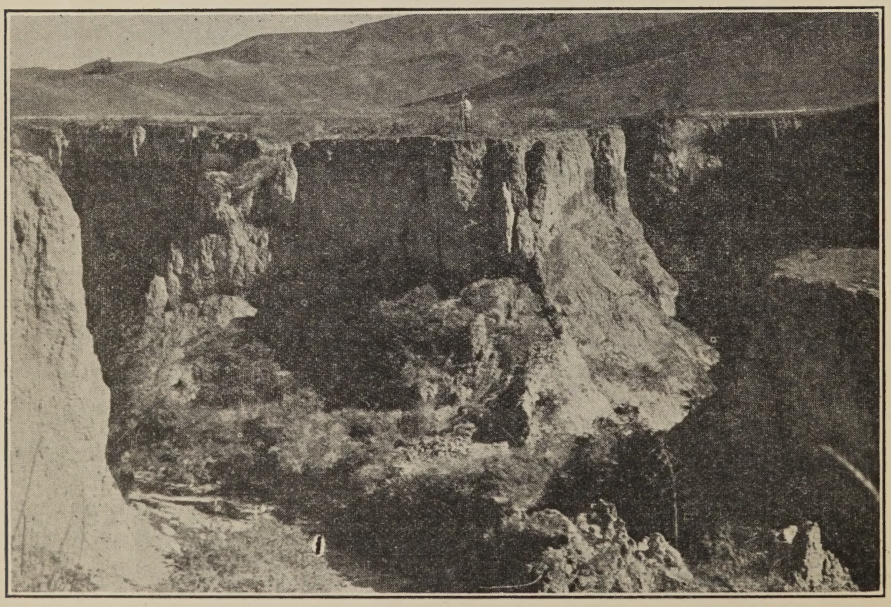
## WHAT "MAN MADE" EROSION IS

There are two general kinds of erosion. One is the ageless geological process that wears down towering mountains to form the fertile valleys and broad plateaus in which we live. It is a beneficent process.

The other kind is "man made," or accelerated erosion,—a rapid, destructive process which has its root in civilization's need for the produce of the soil. It began when man first gave up the pursuit of wild game for his food and started the systematic cultivation of plants and the domestication of food producing animals.

It takes Nature thousands of years or more to make and perfect a single foot of good, rich topsoil; but man may destroy that 12-inch thickness of precious soil in one life span. That is why we call it "man made" erosion.

When man cuts down the trees, plants crops on steep hillsides that had been covered by grass, and plows acre after acre of sloping fields in such manner that water is allowed to flow readily over it and carry soil away, he is inviting erosion. When soil destruction follows his misguided operations, we call it "man made" erosion.



Less than 50 years ago this giant barranca in California was a small ditch that a horse could jump with ease. There are six more just as large within a radius of 12 square miles.

## GOOD SOIL IS A PRODUCT OF THE AGES

Our soils come directly or indirectly from solid rock. A great many processes of nature have cooperated to change this hard and inert material into soil teeming with plant and animal life.

Heat and cold, freezing and thawing, running water and moving ice, are some of the mechanical processes that broke up this rock into fine particles. Plants sent their roots into crevices of the rock and helped to chip off particles. Trees split great boulders by the force of their growing roots.

Along with the physical processes, including leaching and solution, came chemical changes such as oxidation and hydration, so that the composition of the soil material became much different from that of the original rock. Then organic matter was added through the growth and decay of plants. These plants, in turn, provided a home and furnished food for soil bacteria which are so necessary to a productive soil.

Thus no force has been too great nor has any organism been too small to be used in making our soil. The lowly earth worm and microscopic plants and animals played their parts along with mighty forces of glaciers and the rushing rivers.

In the natural processes of soil formation, distinct layers are formed. The surface layer, or topsoil, contains the largest amount of organic matter and bacterial life. In this layer the greatest amount of plant food is available.

The subsoil contains a reserve of plant food and moisture. It does not support bacterial action to any great extent and is relatively unproductive. This emphasizes the importance of preserving the topsoil; when the surface is lost by erosion, the remaining layers are unable to support profitable crops. The third layer is composed of relatively unaltered soil material.

It takes Nature at least 400 years of grinding rocks together, and of gathering and preserving the products of plant decay, to make just one single inch of rich topsoil. This inch of soil, and every succeeding inch, is preserved from the ravages of wind and water by the plant roots that hold the soil with clutching fingers, and by the litter of leaves and twigs that form countless miniature dams to slow up the speed of running water.

Cultivation destroys the protective blanket of plants and allows Nature's accumulation of soil to become a defenseless prey to water and wind.

A soil tragedy in California following a "gullywasher" rain that fell on a newly subsoiled field. A fifty percent soil loss could have been prevented by subsoiling on the contour.

## CAN WE STOP THE TOP SOIL THIEF?

Yes. Although we cannot create soil, we can conserve what we already have. The creation of soil is a task of Nature requiring centuries. The conservation of soil is a sensible, intelligent practice, and its cost is reasonable indeed when we stop to consider what an acre of good land saved today will mean to every succeeding generation that lives upon its produce.

The Soil Conservation Service has developed and approved certain practicable measures to prevent the spread of all types of "man made" erosion and to conserve the remaining fertility of areas already damaged.

These measures fall into two general classes: vegetative and mechanical. On some lands both types of erosion control are necessary; on others, either type may be sufficient to maintain the soil against erosion by wind and water.

In cooperation with state and local agencies and the farmer, the Soil Conservation Service is applying to the land a complete program of erosion control treatment in which each method of control is used, either alone, or in conjunction with other measures.

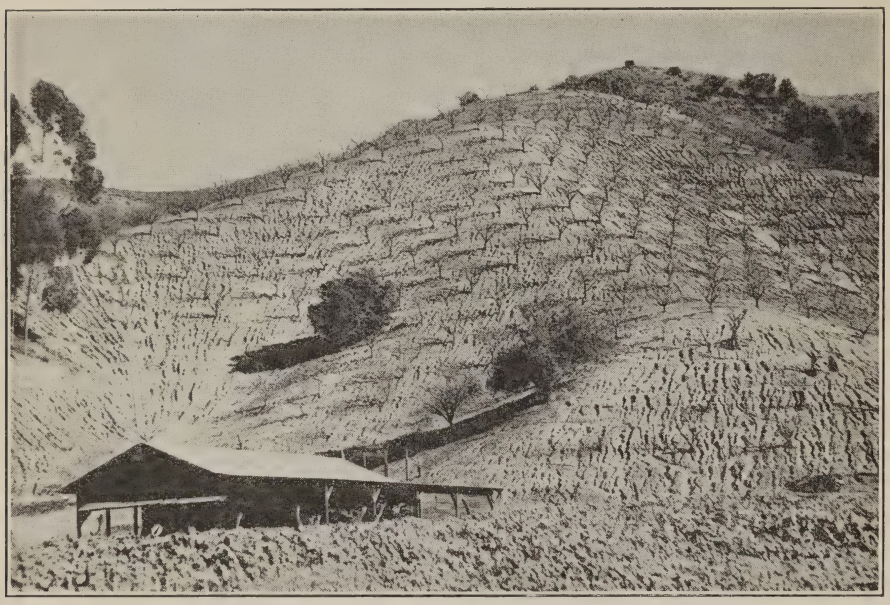

Strip farming to keep the top soil on California hill sides.

Constructing broad base terraces to control shee

erosion in Southern California lima bean fields.

## THREE KINDS OF "MAN MADE" EROSION—ALL BAD

Thousands of Americans believe, and with ample reason, that soil erosion sends great clouds of dust into the air. Spectacular dust storms of the last few years have made wind erosion the symbol of all erosion. But wind erosion is only one form of "man made" soil destruction. Two other forms, both caused by the wearing action of rainwater, far exceed soil blowing in extent and damage done.



Sheet erosion. A third of the top soil gone with one rain! How long will this orchard remain a profitable investment? Such destruction can be stopped.

## WIND EROSION

Wind erosion is a type of soil destruction resulting from the attack of strong winds on land surfaces unprotected by vegetative cover. Spectacular dust storms are only the later stages of wind erosion. Preceding them stand years of unwise land use, producing a lowered moisture capacity and a depleted organic content. While it is a problem in certain sections of California, fortunately it has not yet become a menace in the more highly productive areas of the state.

A complete land use program must be adopted if wind erosion is to be curbed on a permanent basis. Certain tillage measures are effective in an emergency but they are only temporary. Real control of wind erosion can be accomplished when cropping and grazing land is protected by vegetative cover.

## SHEET EROSION

This is the most prevalent of all forms of erosion. It is the gradual washing away, by rainwater, of the rich topsoil from an entire sloping field. It follows the removal of the original protective cover of trees or grass and the plowing of the land. According to surveys and estimates, about 45 percent of the area of the United States, exclusive of large cities and water, has been in some degree affected by this form of erosion.

Sheet erosion presents a three-fold problem: (1) because it may affect an entire farm without concentration at any particular spot and therefore remain unnoticed for a long time, (2) because it removes a thin sheet of topsoil with every heavy rain falling on unprotected slopes, and (3) because it often leads to formation of gullies and ravines.

Nevertheless, if recognized in its initial stages, it can be controlled in a practical way by application of simple measures of protection and conservation.

Hillside land too steep for practical cultivation should be retired from crop production and rededicated to trees and grasses, which are Nature's own weapons against erosion. Vegetation provides the dual benefit of anchoring the soil and reducing run-off of water.

On gently sloping land, any or all of various practical measures may be beneficial according to the requirements of each particular parcel of land. Among these are strip-cropping, which embodies planting of close-growing, soil-conserving crops, such as grasses, alfalfa, or clovers between strips of clean-tilled crops. This system of cultivation is coordinated with a scientific crop rotation whereby the close-growing crops are alternated at periodic intervals with the clean-tilled crops to build up the soil and preserve moisture.

Another important measure is contour tillage, which means plowing along the contour of the land rather than up and down the slopes. The third measure is correct construction of terraces, which are used to conserve moisture as well as carry away surplus run-off water without damage to the land.

## GULLY EROSION

Gullying is a more spectacular form than sheet erosion and is the consequence of uncontrolled, concentrated run-off of rainwater. Usually gullies follow in the wake of sheet erosion on steeper hillsides.

A gully is like a cancer in the land. Tiny rills cutting through the topsoil grow into small gullies, and these, with mushroom-like rapidity, expand to form deep, broad ravines destructive to farm lands. A ditch today may be small enough for a man or horse to jump across. In less than a lifetime it may become a vast chasm extending deep into the earth.

Right here in California there is one such gully. Forty-two years ago a farmer paid his hired man 16 dollars in wages to plow a ditch across his bean field so that the water would drain off. Today more soil has been lost through that ditch than the farmer could have hauled away by truck in many months of work. It is now a gully three miles long, a hundred feet wide and sixty-five feet deep.

The problem presented by this form of erosion is two-fold because the condition causing the gully must be treated as well as the gully itself. In other words, the first step in gully control is to eliminate as far as possible the concentrated flow of water into the gully. The second step concerns the gully itself. The objective in most gully control work is eventual stabilization of the gully by vegetation. This usually requires mechanical structures such as dams and in some cases it is also necessary to slope down the banks in order to plant grass, trees, vines or shrubs.

The dark, fertile surface soil of this abandoned field of Honda loam has been partly stripped by sheet erosion; while active gullies have cut down the 7% slope through the dense non-productive subsoil and into the soft, highly erosive substratum

## THE SOIL CONSERVATION SERVICE

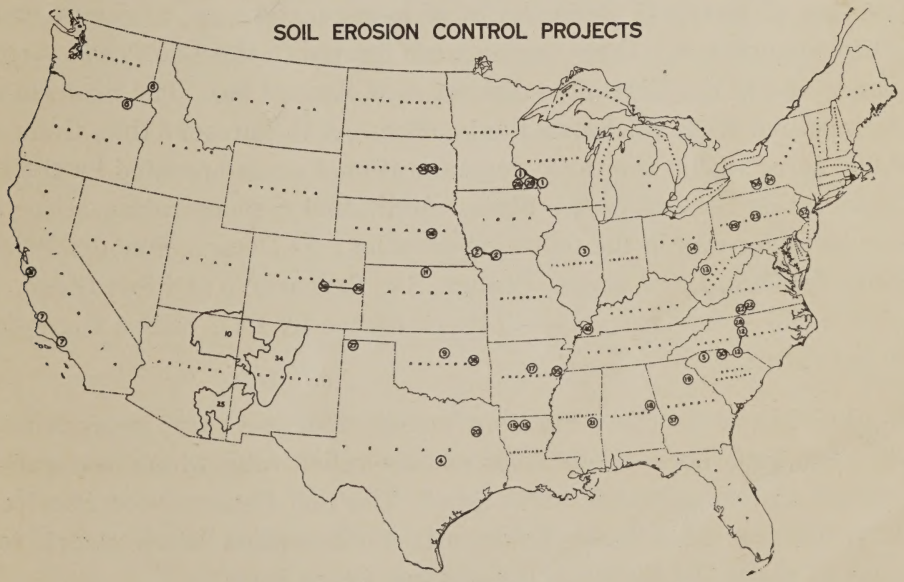
In cooperation with State agencies the Federal Government has entered actively into the field of soil conservation. It is attempting to show the farmers and landowners of the country just how they can protect their soil.

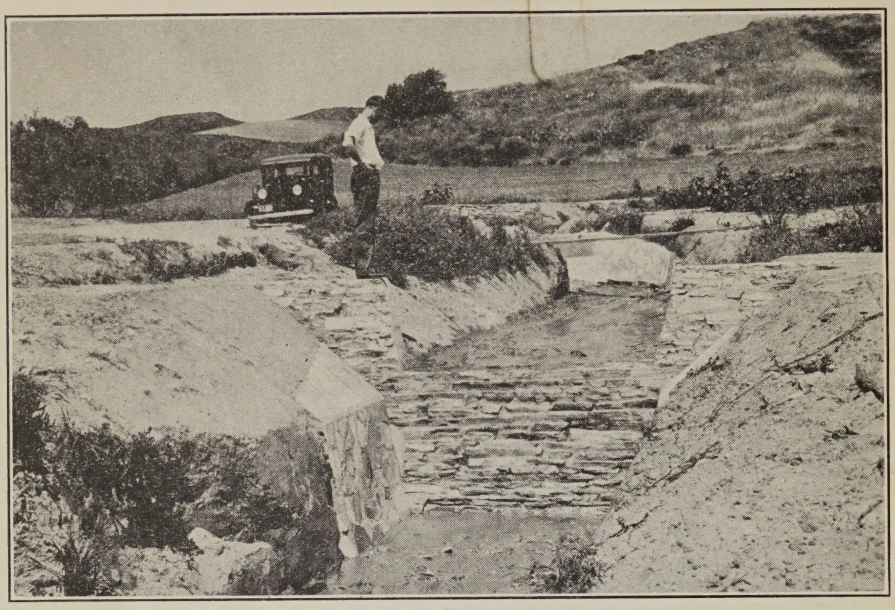
To this end, the Soil Erosion Service of the Department of Interior was established in October, 1933. In order to coordinate and unify all the soil conservation activities of the Government in one organization, the Service was transferred this year to the Department of Agriculture and renamed the Soil Conservation Service.

The broad objectives of the Service are to demonstrate that the impoverishment and destruction of the remaining areas of good agricultural land can be controlled to a large extent and to lay the foundation for a permanent erosion control program of adequate scope to meet the crisis created by wasteful methods of land utilization.

At the present time 40 demonstration projects have been established in representative watersheds throughout the country to demonstrate the erosion control measures approved by the Service. In the very near future the number of these demonstration projects will be increased as the program is expanded.

Each project is completely staffed with specialists in the control of erosion. There are soil specialists, agronomists, agricultural engineers, foresters, and specialists dealing with range management and farm management. Each has a particular part to play and each performs specific functions. Yet all work together, coordinating their efforts for the common goal—conservation of the soil.





Rock dams of native stone check the process of gullying on California farm lands.

## THE SOIL CONSERVATION SERVICE IN CALIFORNIA

In California, the Soil Conservation Service is under the immediate direction of Harry E. Reddick. Staff headquarters are at Santa Paula, California, while the three projects are located in the Las Posas, Arroyo Grande and in the Corralitos district near Santa Cruz. The projects are administered from the Santa Paula office. At the present time there are 93,000 acres within the three demonstrational areas operated by the Soil Conservation Service in the State. Additional demonstration areas will soon be under way in the following counties: El Dorado, Sonoma, Solano, Santa Barbara, Los Angeles, Orange, San Bernardino and San Diego. All labor in these new projects will be furnished by CCC camps augmented by the farmers.

In addition to the permanent members of the staff, approximately 350 men have been taken from county relief rolls where the various projects and sub-projects are located. The Soil Conservation Service in California has used three Emergency Conservation Work camps composed of about 700 Civilian Conservation Corps boys.

## PROGRESS IN THE WAR AGAINST EROSION IN CALIFORNIA

Since the establishment of the first California project in January, 1934, the Soil Conservation Service has shown marked progress in its program. Operating in three widely separated parts of the State, it has been faced with the problem of controlling erosion of every type, with the exception of wind erosion. In many instances it has had to treat land where considerable soil losses have taken place.

The first project to be established consists of approximately 25,000 acres of land in the Las Posas area of Ventura County, in a district largely devoted to the raising of lima beans on non-irrigated land, as well as citrus and walnuts. The erosion problem was particularly difficult in this area because of the common practice of cropping slopes that often approached a 50 percent grade. It is in the Las Posas area that serious gullies are found, some of them having vertical side walls of from 65 to 90 feet and a width exceeding 100 feet.

The second demonstration area is known as the Arroyo Grande project and is located in San Luis Obispo County. It consists of about 6,500 acres of non-irrigated land. Winter peas and grain are the principal crops.

Near Santa Cruz, approximately 68,000 acres have been designated as the Corralitos Creek project. In this area the land is rolling and in some portions rainfall is heavy, providing a potential threat of erosion. Fruit comprises one of the principal crops of the region.

During the year and five months prior to May 1, 1935, the Soil Conservation Service in California had entered into cooperative agreements with 123 land owners living within the boundaries of its projects. These agreements specify the methods of land use to be employed on 15,668 acres. In addition, more than 45,000 acres of land within the State have been surveyed in detail. Also, 3,500 acres of eroded land have been brought under control, involving the building of approximately 804 miles of terraces, the excavation of approximately 62,000 feet of diversion ditches, the planting of 1,200 acres of erosion resisting crops, the construction of better than 1,600 permanent dams and the retirement of more than 4,000 acres of seriously eroded land from cultivation.

## KEEP THE RAIN DROP WHERE IT FALLS

There is no simpler way to state the solution of the problem of accelerated erosion, as it is found along the Pacific Coast, than: KEEP THE RAIN DROP WHERE IT FALLS. Water, under natural conditions, ranks with sunshine as a friend of man; but man, in his cultivation of the soil, has altered natural conditions, and in so doing has changed friendly rains into harbingers of ruin.

Rains usually carry with them a little soil as they run off the land, but this is a natural process. Natural erosion is so slow and so gradual in effect that its changes can be measured only by centuries of time. It pulverizes rock from the mountain tops to build fertile soil in the valleys below. In this way geological erosion has been a friend of man since the beginning of time.

Civilized man strips the protecting carpet of grasses and trees from the surface of the earth, leaving the rich, loose, food-filled soil a ready and easy prey for running water or sweeping wind. Nature intended the grasses and trees to cover the soil with a litter that formed millions of little dams to slow the water. Nature also intended the plant roots to hold the soil in place like clutching fingers. But man destroys these guardians of his most valuable natural resources.

The problem of soil conservation is a relatively simple one. The great waste can be stopped in large measure by restoring trees and grasses to highly erodive lands, and by cultivating, planting and irrigating on the contour. The continued prosperity of agriculture in our state and nation depends in large measure upon the understanding and cooperation of the men who till the soil.

KEEP THE RAIN DROP WHERE IT FALLS

**U. S. Department of Agriculture**

**Soil Conservation Service**

**Harry E. Reddick, Regional Director** **Santa Paula, California**